

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* VIK ARILD

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Appeal 2007-3552  
Application 09/787,902  
Technology Center 1700

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Decided:

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Before CHUNG K. PAK, CHARLES F. WARREN, and  
CATHERINE Q. TIMM, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 5 through 9, 16, and 18, all of the claims pending in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

*STATEMENT OF THE CASE*

The subject matter on appeal is directed to a method of producing “hydrogen and carbon by pyrolysis based on natural gas, methane or other organic gases as raw material” (Specification 1). Further details of the appealed subject matter are recited in representative claims 5 and 9 reproduced below:

5. A method of producing hydrogen and carbon in a recycling process by pyrolysis of an organic gas utilizing carbon dust as a catalyst for precipitation of carbon characterised [sic. characterized] by stimulating carbon precipitation by guiding the gas through a heated reaction chamber where the carbon molecules from the gas can attach to the catalytic particles causing growth of these to a pre-set size that can be mechanically trapped.

9. A method of pyrolysis of an organic gas comprising passing said gas through a heated reaction chamber containing carbon dust such that carbon from said gas is caused to precipitate onto said carbon dust causing growth of the size of the carbon particles to a trappable size, removing said trapped particles from the heated reaction chamber, and returning a portion of said trapped particles after crushing to a fine dust to the heated reaction chamber.

As evidence of unpatentability of the claimed subject matter, the Examiner has relied upon the following references:

Bansch	DE 118263 A	Feb. 20, 1976
Voet et al. (Voet), “Porosity of Carbon Blacks,” 9 <i>Carbon</i> 135-138, (1971)		

The Examiner has rejected the claims on appeal as follows:

1. Claims 5 through 9, 16 and 18 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention (Answer 4);

2. Claims 5, 8, and 18 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103 as obvious over the disclosure of Voet (Answer 3); and

3. Claims 5 through 9, 16, and 18 under 35 U.S.C. § 103(a) as unpatentable over the disclosure of Bansch (Answer 3).

The Appellants appeal from the Examiner's decision rejecting the claims on appeal under 35 U.S.C. §§ 112, 102(b) and 103(a).

*PRINCIPLES OF LAW, FACTS, ISSUES and ANALYSES*  
*INDEFINITENESS*

As stated in *In re Moore*, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971), the determination of whether the claims of an application satisfy the requirements of the second paragraph of 35 U.S.C. § 112 is merely to determine whether the claims do, in fact, set out and circumscribe a particular area with a reasonable degree of precision and particularity. It is here where the definiteness of language employed must be analyzed . . . not in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art. [Emphasis added.]

The purpose of the second paragraph of § 112 is to ensure that the claims of an application reasonably apprise one of ordinary skill in the art of their scope. *In re Warmerdam*, 33 F.3d 1354, 1361, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994); *In re Hammack*, 427 F.2d 1378, 1382, 166 USPQ 204, 208 (CCPA 1970).

Applying the above principles of law to the present situation, we determine that the Examiner has not demonstrated that one of ordinary skill

in the art would not have understood the preamble limitation “producing hydrogen and carbon in a recycling process” recited in claim 5, especially when it is read in light of the Specification. Contrary to the Examiner’s argument at page 4 of the Answer, we find nothing in the Specification and claim 5 which are not consistent with the preamble limitation in question. In fact, the Specification clearly evinces producing hydrogen and carbon in a reaction zone of a recycling process involving the reuse of at least a portion of the carbon product recovered as catalysts (seeds) and/or at least a portion of the non-pyrolized organic gas from the reaction zone as a raw material (pp. 1-4).

The Examiner has also identified an insufficient basis for rejecting the terms “fine,” “crushing,” and “down to” recited in claims 9 and 18, respectively. Although the terms may be broad or grammatically questionable, the Examiner has not demonstrated that they are so unclear that one of ordinary skill in the art cannot ascertain the scope of claims 9 and 18, especially when they are read in light of the Specification. The Examiner, for example, has improperly ignored the teachings of the Specification describing any fine carbon particles (dust) suitable or sufficient as catalysts (seed materials) at the claimed operational temperatures, i.e., a temperature range having the lowest limit of 400°C.

Accordingly, based on the reasons set forth in the Brief and above, we are constrained to agree with the Appellant that the Examiner has not demonstrated that the subject matter defined by claims 5 through 9, 16, and 18 is indefinite within the meaning of 35 U.S.C. § 112, second paragraph.

*ANTICIPATION*

Under 35 U.S.C. § 102(b), anticipation is established only when a single prior art reference describes, either expressly or under the principle of inherency, each and every element of a claimed invention. *In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990).

The dispositive question is, therefore, whether Voet teaches each and every limitation recited in claims 5, 8, and 18 within the meaning of 35 U.S.C. § 102(b). On this record, we answer this question in the negative.

As indicated *supra*, the subject matter defined by claims 5, 8, and 18 is directed to producing hydrogen and carbon in a recycling process, which according to pages 3 and 4 of the Specification includes the recycle of at least a portion of the carbon product and/or the unpyrolyzed organic gas recovered from a reaction zone. The claimed recycling process limitation denotes ways in which some of the raw and/or catalytic materials (unpyrolyzed organic gas and/or crushed carbon products) are provided to form carbon and hydrogen. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165-66 (Fed. Cir. 1999) (“If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is ‘necessary to give life, meaning, and vitality’ to the claim, then the claim preamble should be construed as if in the balance of the claim . . . . If, however, the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention’s limitations, but rather merely states, for example, the purpose or intended use of the invention, then the preamble is of no

significance to claim construction because it cannot be said to constitute or explain a claim limitation.”); *In re Geerdes*, 491 F.2d 1260, 1262-63, 180 USPQ 789, 791 (CCPA 1974) (“[E]very limitation in the claim must be given effect . . . ”); *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970) (“All words in a claim must be considered in judging the patentability of that claim against the prior art.”). However, as correctly argued by the Appellant (Br. 10), the Examiner has not demonstrated that Voet expressly or inherently teaches forming hydrogen and carbon in the claimed recycling process.

Accordingly, based on the reasons set forth in the Brief and above, we are constrained to agree with the Appellants that Voet does not render the subject matter defined by claims 5, 8, and 18 anticipated within the meaning of 35 U.S.C. § 102(b).

### *OBVIOUSNESS*

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations (e.g., unexpected results). *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18, 148 USPQ 459, 467(1966). “[A]nalysis [of whether the subject matter of a claim would be obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l Co. v. Teleflex, Inc.*,

127 S. Ct. 1727, 1740-41, 82 USPQ2d 1385, 1396 (2007) *quoting In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336-37 (Fed. Cir. 2006); *see also DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1361, 80 USPQ2d 1641, 1645 (Fed. Cir. 2006) (“The motivation need not be found in the references sought to be combined, but may be found in any number of sources, including common knowledge, the prior art as a whole, or the nature of the problem itself.”); *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969)(“Having established that this knowledge was in the art, the examiner could then properly rely, as put forth by the solicitor, on a conclusion of obviousness ‘from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.’”).

*Rejection Based on Voet*

Here, the Appellants do not dispute the Examiner’s finding that:

Voet teaches on pg. 135-136 decomposing methane to deposit carbon on particulate carbon. No mention is made of forming hydrogen, however this is deemed to occur since the hydrogen is not otherwise accounted for. The carbon substrate is ‘micropulverized’ to a size of 1800A which is deemed to be indistinguishable from ‘dust’.

(Compare Answer 3 with Br. 12-13 and Reply Br. 1-3.) Rather, the Appellant contends that Voet does not provide any suggestion or motivation to employ the claimed recycling limitation, i.e., recycling or reusing the unpyrolyzed organic gas, such as unpyrolyzed methane, and/or the resulting carbon product in a reaction zone for producing carbon and hydrogen (Br. 12-13 and Reply Br. 2-3).

Therefore, the dispositive question is whether one of ordinary skill in the art reading the disclosure of Voet would have been led to reuse or recycle unpyrolyzed methane and/or carbon products in its reaction zone for producing carbon products and hydrogen within the meaning of 35 U.S.C. § 103(a). On this record, we answer this question in the affirmative.

As indicated *supra*, Voet teaches decomposing (pyrolyzing) methane in the presence of fine carbon particles in its reaction zone to produce carbon products and hydrogen. Implicit in this teaching is that Voet's reaction zone requires the supply of methane and fine carbon particles for producing desired products. Thus, providing methane and fine carbon particles from the existing carbon and methane sources, i.e., micropulverized carbon products and undecomposed methane, would have reasonably expected by one of ordinary skill in the art to at least save the cost associated with transporting and buying the raw materials for producing carbon products and hydrogen. *KSR*, 127 S. Ct. at 1740-41, 82 USPQ2d at 1396; *see also In re Thompson*, 545 F.2d 1290, 1294, 192 USPQ 275, 277 (CCPA 1976) ("Eliminating the cost . . . would have been sufficient motivation for doing so."); *In re Clinton*, 527 F.2d 1226, 1229, 188 USPQ 365, 367 (CCPA 1976) ("Economics alone would motivate a person of ordinary skill in the art . . ."). This is especially true in this situation since recycling or reusing, rather than discarding, at least undecomposed methane to provide the needed methane in Voet's reaction zone is reasonably expected to provide a significant economic advantage.

As to claim 18, contrary to the Appellant's argument at page 13 of the Brief, Voet teaches employing a methane decomposition temperature of 1050°C well within the claimed broad temperature range.



Accordingly, based on the factual findings set forth in the Answer and above, we determine that the preponderance of evidence weighs most heavily in favor of obviousness of the subject matter recited in claims 5, 8, and 18 within the meaning of 35 U.S.C. § 103.

*Rejection based on Bansch*

The Appellant does not dispute the Examiner's finding that Bansch teaches in ex. 1 heating carbon particles by heat exchange from another process, then depositing carbon on them from the decomposition of a hydrocarbon. The product can be milled and recycled.

(Compare Answer 3, with Br. 14-15 and Reply Br. 2-3.) We find that Bansch teaches that the decomposition of the hydrocarbon also forms hydrogen as required by claim 5 (p. 4, Example 1). We find that Bansch teaches classifying and grinding the resulting carbon particles (p. 4). In other words, we find that Bansch's carbon products are trappable sizes (classifiable) contrary to the Appellant's argument at page 15 of the Brief.

Therefore, the dispositive question is whether Bansch would have suggested the claimed fine carbon dust particles as seed or catalytic materials in its reaction zone within the meaning of 35 U.S.C. § 103(a). On this record, we answer this question in the affirmative.

As indicated *supra*, Bansch teaches employing carbon particles which are inclusive of the claimed fine carbon dust particles. More importantly, both the Examiner at page 3 of the Answer and the Appellant at page 14 of the Brief acknowledge that Bansch teaches recycling carbon products that have been milled (like the Appellant's carbon products that have been crushed). Implicit in this teaching is that the carbon particles employed in Bansch's process include the claimed carbon particle sizes, i.e., fine carbon

dust particles. This is especially true in this case since it is well within the common knowledge of one of ordinary skill in the art to increase the surface area of particles by making them finer or smaller, thus optimizing the heat transfer and seed or catalytic functions of the carbon particles taught by Bansch. *KSR*, 127 S. Ct. at 1740-41, 82 USPQ2d at 1396. Thus, we determine that Bansch as a whole would have suggested employing carbon particles, including that claimed, in its process for producing carbon and hydrogen within the meaning of 35 U.S.C. § 103(a).

Accordingly, based on the factual findings set forth in the Answer and above, we determine that the preponderance of evidence weighs most heavily in favor of obviousness of the subject matter recited in claims 5 through 9, 16, and 18 within the meaning of 35 U.S.C. § 103.

*ORDER*

In view of the foregoing, the decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

**AFFIRMED**

APJ INITIALS:

CKP

CFW

CQT

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